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13. ABSTRACT (Maximum 200 words)

The research performed by James Todd during the past year of AFOSR support has examined the abilities of human observers to determine an object's 3-dimensional form from various types of optical information such as shading, texture, motion or binocular disparity, both individually and in combination. The results of this research have provided strong evidence that 3-dimensional structure may be perceptually represented in a manner that is similar to the Klein hierarchy of geometries, such that observers are most sensitive to those aspects of an object's structure that remain invariant over the largest number of possible transformations. The evidence to support this hypothesis has been obtained using a wide variety of converging operations, including judgments of euclidean 3D length, judgments of conformal properties such as 3D angles, and judgments of affine properties such as planarity. We have also examined how these judgments are influenced by combining different types of optical information using both computer simulations and direct viewing of natural scenes

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